

Serial Movement in Collegiate Athletes who perform Injury Prevention Training

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Study Protocol

Objective

The overall objective of the study was to longitudinally evaluate multiple aspects of neuromuscular control (i.e., movement quality, balance) across several time points during a single athletic season in collegiate athletes who perform neuromuscular training.

Design

We used a prospective, experimental case series study design to evaluate neuromuscular control over an athletic season in collegiate athletes performing PTPs. We collected neuromuscular control data at three time points (PRE, MID, POST) during each athletic season. PRE occurred during the first two weeks of the athletic season, MID occurred during the middle of the athletic season, and POST occurred during the last two weeks of the athletic season.

Methods

Athletes age 18+ on the men's and women's volleyball, soccer, and basketball teams at one NCAA Division III University were recruited to volunteer for this study. All participants completed informed consent forms, which were approved by the University's Institutional Review Board.

LESS score was attained using a valid and reliable 2-dimensional motion capture system (Physimax Technologies, Tel Aviv, Israel) that utilizes an Xbox Kinect camera (Microsoft, Redmond, WA) and Dell (Round Rock, TX) laptop computer to automate LESS score. BESS score was attained using a pressure mat and associated software that automatically scores all 6 BESS stances (TekScan, Boston, MA), a system which has been shown to be a reliable method to assess the BESS. Participant height was measured using a standard stadiometer. Participant mass was measured using a digital scale. Participant age, race, and ethnicity were captured using a pen-and-paper questionnaire. Gender was determined by team participation.

Participants completed three test sessions, all of which included a jump-landing task, scored by the LESS, to assess movement control and the BESS to assess balance. At the first test session, participants' height and mass was also measured. All tasks (LESS, BESS, height, mass) were completed in a random order. All test session occurred prior to team practices.

For the LESS, participants were instructed to jump forward off a 30-cm-high box to a distance of approximately half their height, indicated by a line on the floor, and then jump up for maximal vertical height immediately upon landing. Participants jumped as many times as needed to record three good trials, up to five total jumps. Errors were automatically scored using a 2-dimensional motion capture system described in materials. For the BESS, participants completed six total conditions, consisting of 3 stances (double-limb stance, single-limb stance, tandem stance) on 2 surfaces (firm,

foam). For each condition, participants are instructed to maintain the appropriate stance on the appropriate surface for 20 seconds. Errors were automatically scored using the pressure mat described in materials.

Statistical Analysis Plan

The mean LESS score for three trials was used for analyses. BESS score was calculated by summing scores from all six conditions. We used a 2X3 ANOVA to evaluate changes in LESS and BESS over time (PRE, MID, POST). As previous research has shown variability in neuromuscular control measures over time in athletes that do not perform PTPS, we used a multivariate correction for these analyses. Post hoc pairwise comparisons were evaluated for significant results using 95% confidence intervals.